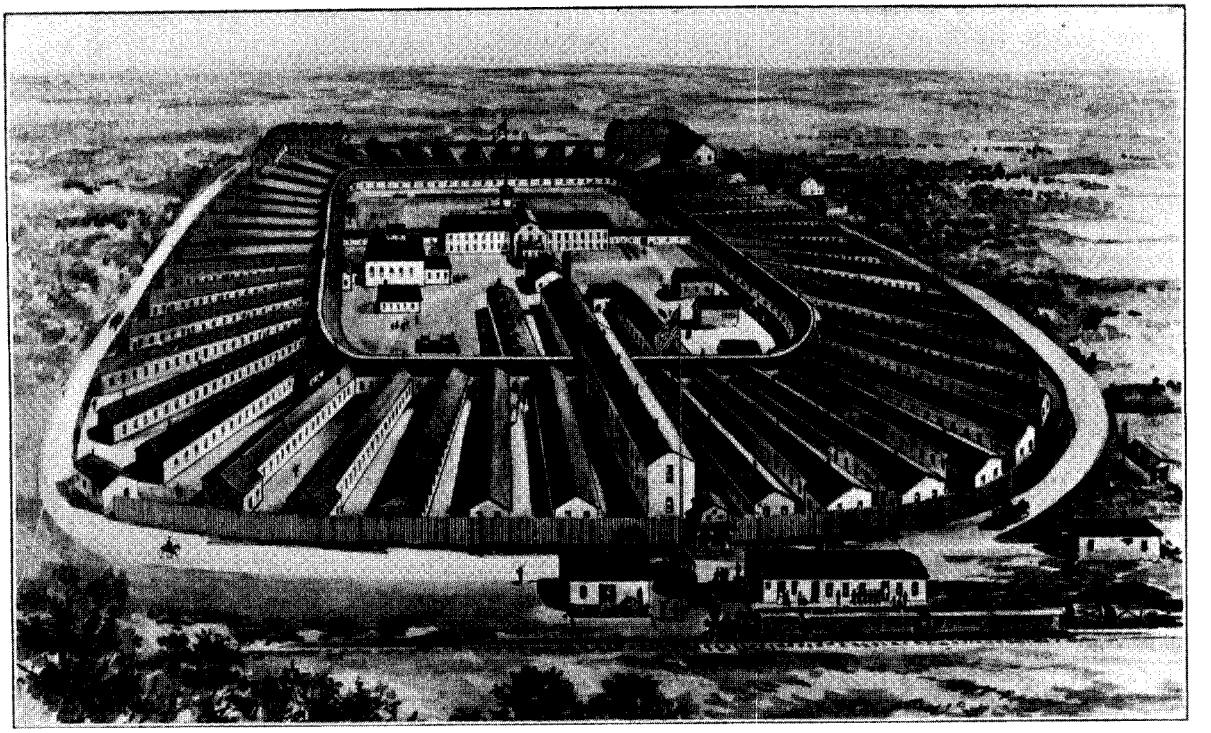
Captain Josiah Gorgas, commandant at the Frankford Arsenal from 8 June 1860 to 3 April 1861; later Chief of Ordnance, C.S.A.

—Frankford Arsenal, Philadelphia

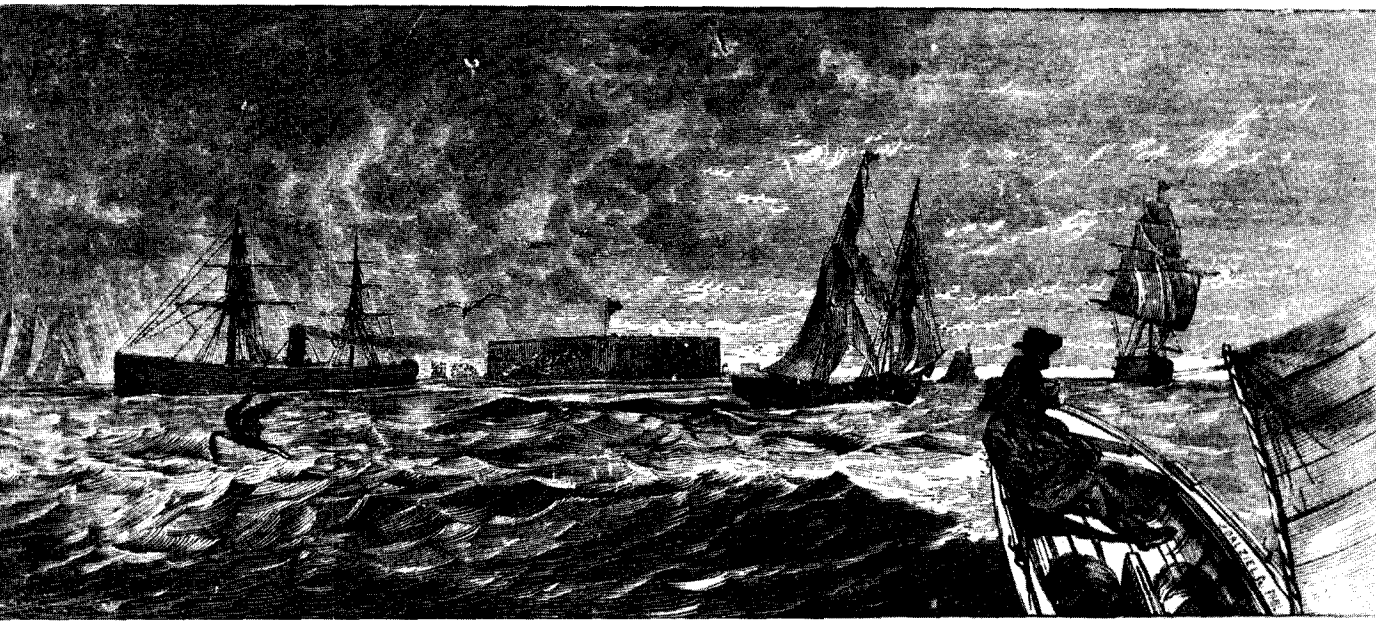
supposedly well-stocked Frankford Arsenal, only to find the cupboard bare. Captain Josiah Gorgas, the arsenal commandant and a man of strong southern sympathies, had managed to ship the greater part of the arsenal's ordnance and artillery south, including a 29 January shipment of twenty carloads of rifles to a destination considerably south of the originally logged "Washington." On 3 April, Gorgas resigned, following his secret "care packages" south, and ultimately rising to command the Confederate Ordnance Department.

In the course of the war, the city served as evacuation and hospitalization center for tens of thousands of wounded soldiers, who streamed north from Southern and Western battlefields. A vast network of military hospitals was established in the city, including the 4000-bed Mower General Hospital in Chestnut Hill, and the 4500-bed Satterlee General Hospital in West Philadelphia. There some of the 157,000 wounded cared for in Philadelphia hospitals during the war received treatment—having been evacuated by boat up the Chesapeake, by barge through the C&D Canal, thence up Delaware Bay and the Delaware and Schuylkill Rivers to Gray's



Mower General Hospital. The second major military hospital in the Philadelphia area during the Civil War. This 4,000 bed facility was located in Chestnut Hill, on the northwestern outskirts of the city.

—Free Library of Philadelphia



Delaware River and Fort Delaware, 1872. Van Ingen Snyder, Philadelphia. —Free Library of Philadelphia

Ferry, where they were disembarked, transferred to ox-carts, and trundled off to Satterlee General.[19]

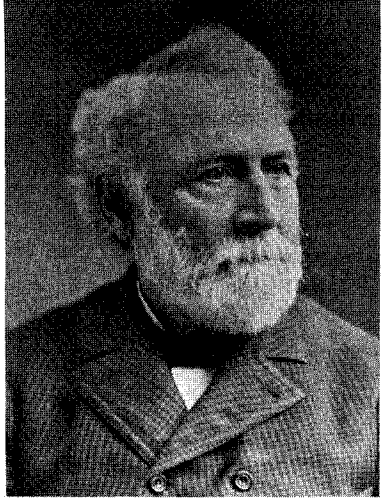
In 1866, with the founding of a permanent Philadelphia Engineer District, contracts were let to complete work on Forts Mifflin and Delaware, and to examine other sites along the River which might strengthen the region's defenses. War-time introduction of rifled artillery on a mass production basis made possible accurate long-distance bombardment of fixed masonry fortifications and rendered them obsolete almost overnight. The damage done to masonry scarps by armored monitors, and occasionally by distant guns on land where such was possible, showed conclusively that the masonry scarp on sea fronts must be dispensed with, as it had been centuries before on land fronts. Consequently, beginning shortly after the Civil War, all new batteries built for our seacoast defenses had earthen exterior slopes, and no additional masonry scarps were built.[20]

Later, concrete emplacements were added to protect the increasingly heavy guns needed for sea coast defense. In the Philadelphia District, work went on, repairing and refurbishing Forts Mifflin and Delaware. At Fort Mifflin in 1871, a detached "high" battery of large guns was begun south of the main fort, towards Hog Island. It was to have mounted nine guns, two magazines, and six mortars—and while earthworks, foundations, and gun mounts were built, funds ran out in 1875 and no guns were mounted. Mifflin did acquire "a new earthen battery for heavy guns" in 1875, and extensive repairs to a breached dike caused by heavy storms in 1878. At Fort Delaware, a general repair effort was initiated—concrete magazines and *barbette* platforms for contemplated fifteen inch guns were constructed (1871-1873), and dike and storm damage repaired in 1879.

Satterlee U.S.A. General Hospital was, as this 1864 poster relates "perhaps the largest and most complete Army Hospital in the world. It covers sixteen acres of ground. There are 24 wards, containing 4500 beds. The length of the buildings is 900 feet. There are altogether 7 acres of floors. It was opened for the reception of our brave, sick and wounded

soldiers, June 9th, 1862. Admitted up to May 27th 1864—12,773. Deaths, 260. Since the great battles of the Wilderness and Spottsylvania, there have been several hundred tents put up outside of the enclosure, as the accommodations are not sufficient for the large number of patients daily arriving from the field."

—Free Library of Philadelphia



Col. J.N. Macomb

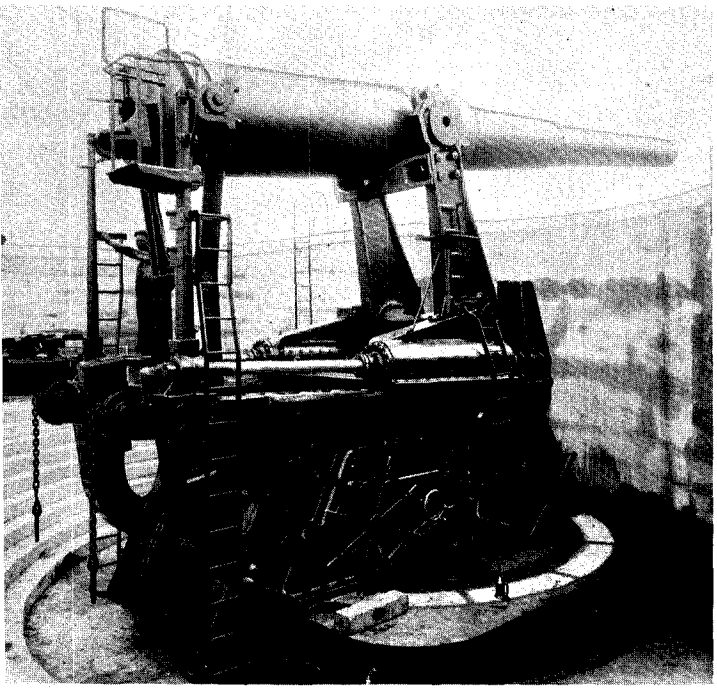
Other sites along the Delaware which had been employed as temporary batteries during the war were examined as possible locations for new river fortifications. Land was acquired at Red Bank, New Jersey, and general improvements were made on it, but no defenses were constructed.

Opposite Fort Delaware, however, on both the New Jersey and Delaware shores, new fortifications were begun. A ten gun earthen battery with emplacements for two fifteen inch guns was erected on the Jersey side, and dubbed Fort Mott, while additional mortar and gun emplacements were installed at nearby Finn's Point. On the Delaware side, below Delaware City, a new fort was begun. Known at first as the "Fort Opposite Fort Delaware," it began as a ten gun earthen *barbette* battery built by Lieutenant Colonel H. Brewerton in 1864. Between 1870 and 1876, an additional earthen battery to mount twenty guns, wharves, and emplacements for two fifteen inch Rodman guns were constructed under the direction of Lieutenant Colonel John D. Kurtz, and later Colonel J. N. Macomb and Captain William Ludlow, for the new fort, now renamed Fort Dupont.[21]

The storm of 1878 did tremendous damage to all works along the Delaware, as can be attested by this extract from the report of the Philadelphia District, dated 2 January 1879.

> *The storm of October 23 ultimo, though fortunately of brief duration, was very severe, and its greatest strength seems to have been developed in the valley of the Delaware River, where it was accompanied by an unprecedented rise of the water surface. The tide surmounted all the dikes, inclosing the low and reclaimed lands bordering on the river, caused immense damage to all owners and occupants of such lands by the destruction of their crops and costly dikes, and exaggerated the disasters to shipping by sweeping inland many of the smaller class to distances from the river ranging from a few yards to one and one half miles. The reports to the Chief of Engineers by Colonel Macomb, of November 6 and 15, supply many of the details of the damage done to the government property, but the estimates submitted therewith were partial only, and contemplated merely making such repairs as were absolutely necessary. The total public and private losses at the forts and batteries could not be repaired for less than double these estimates.*
>
> *At Fort Mifflin, the tide attained its maximum of eleven feet and three inches above mean low water at 10 a.m., and was maintained at this height until 12:45 p.m., when it began to recede. At Fort Delaware many of the people living on the island barely escaped with their lives, the water rising five feet in an hour and a half and reaching a height of eleven feet and eight inches above mean low water.*
>
> *At both forts the outlying buildings most exposed to the storm were either gutted or destroyed, and the magazines, storehouses, and quarters flooded to a depth of from two to four feet. Had they been garrisoned at*

The defenses of Fort Mott, opposite Fort Delaware on the New Jersey side, eventually encompassed three 12-inch breech-loading rifles on disappearing carriages; three 10-inch breech loading rifles on disappearing carriages; two 5-inch rapid fire guns on balanced pillar mounts and two 3-inch rapid fire guns, on pedestal mount. Construction began in 1872, and through a series of incarnations the work was completed in December 1906.



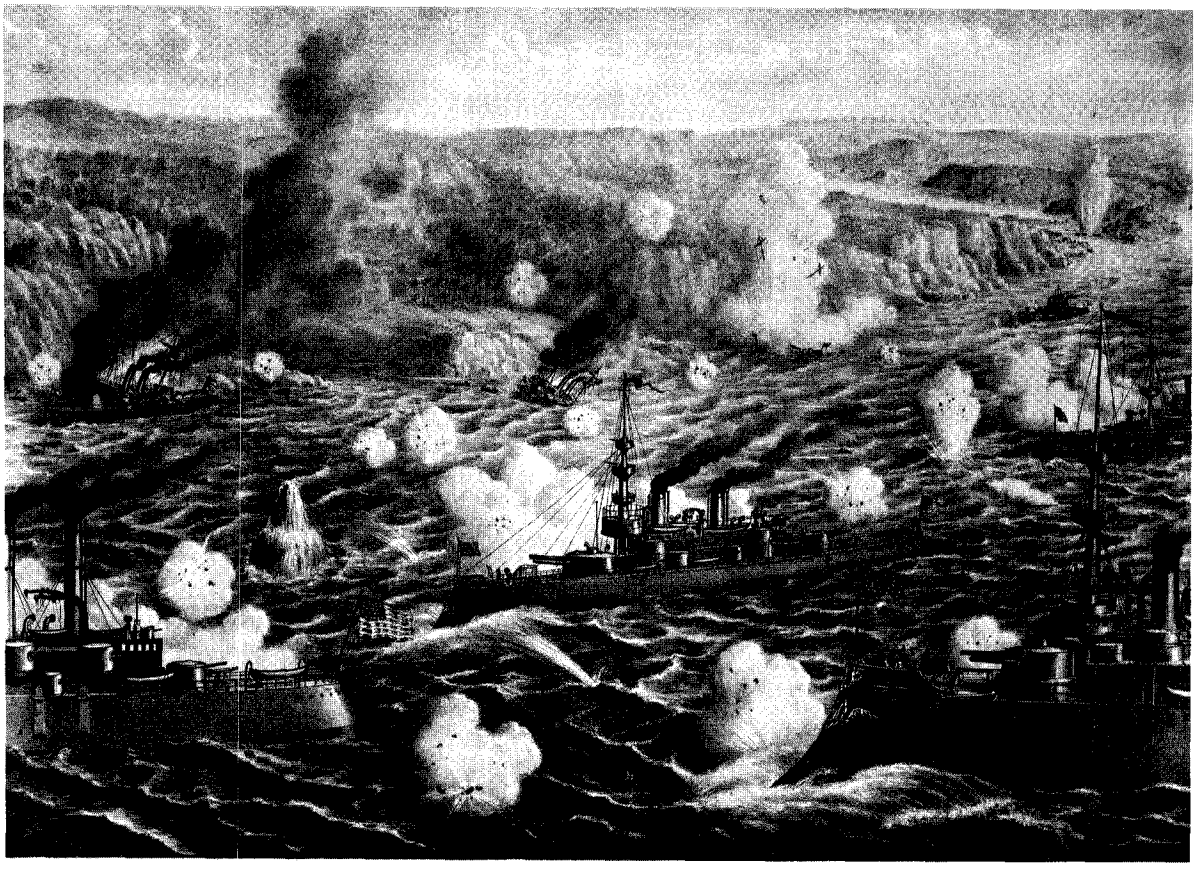
Ten-inch breech-loading rifle on disappearing carriage in firing position over parapet of Battery Harker, Fort Mott, New Jersey. Guns were capable of firing at five-minute intervals.

—National Archives

> *the time, the destruction of property would have been much greater.*[22]

In the years following the flood, much of the military construction authorized was for funds to repair and dike the fortifications devastated by the flood of '78. Construction languished in the 1880's, except for "torpedoes" or submarine mine defenses, which were continually being installed and repaired at Forts Mifflin and Delaware from 1873 through the turn of the century.

From 1871-1873, and for nearly twenty years thereafter, seacoast fortification construction was almost abandoned in the United States. Before it was resumed—about 1890—a number of important developments had taken place. Breech-loading guns had completely replaced the older muzzle-loaders for all large guns and mortars. Disappearing gun-carriages had been invented and had proven a success. Breech-loading mortars were shown to have sufficient accuracy for seacoast use and had consequently become a principal element of seacoast defense. Because of these new developments, seacoast emplacements in the United States consisted either of direct fire



Destruction of Admiral Cervera's Spanish Fleet off Santiago de Cuba.

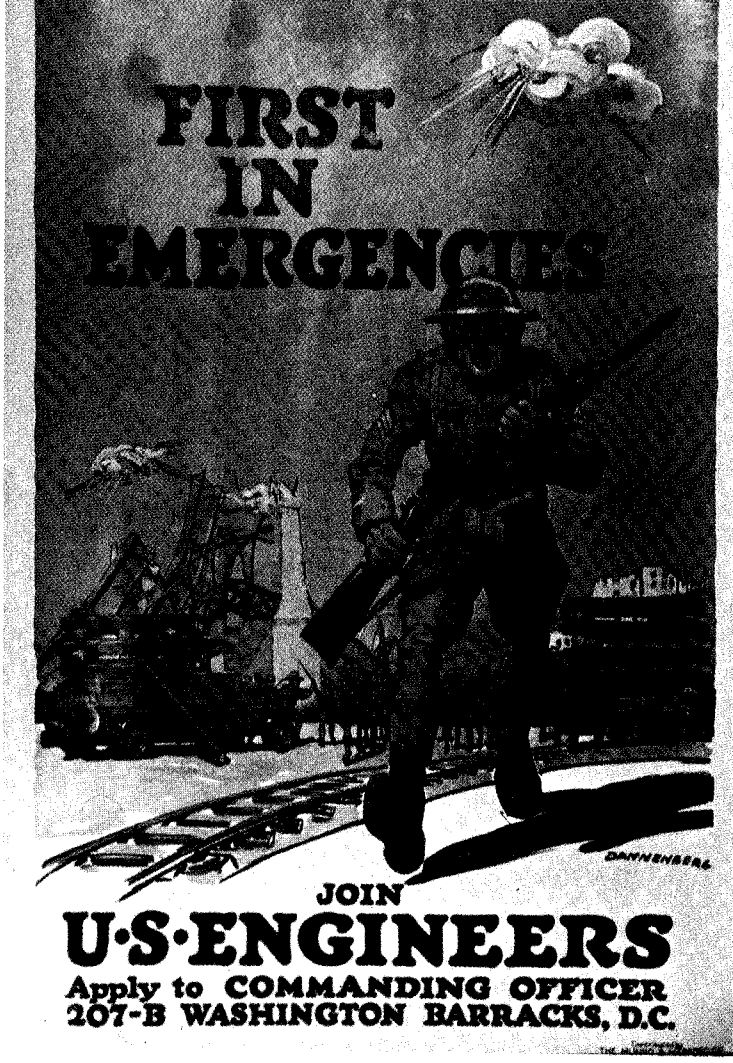
—Library of Congress

guns mounted on disappearing carriages in concrete emplacements, with thick sand parapets in front on top of their magazines, or of mortar batteries with concrete mortar platforms placed behind concrete magazines surmounted and protected in front by heavy parapets of sand.[23]

Work on rebuilding Fort Delaware in the new style began in 1897, following a Congressional appropriation the year before. Half of the three story brick building west of the parade and the entire building fronting the New Jersey side of the fort were razed, and replaced by heavy concrete emplacements for three twelve-inch disappearing guns (Battery Torbert) together with ammunition storage rooms and elevators. At the north end of the island an earth-covered concrete mine-control center was built. Three batteries of three-inch guns were also installed south of the fort—Batteries Allen, Alburtis, and Dodd.

Forts Dupont and Mott were provided with still more powerful armaments—Fort Dupont mounted two eight-inch mortar batteries, two twelve-inch disappearing guns, two eight-inch guns and four five inch guns. Fort Mott was armed with three twelve-inch guns, three ten-inch guns, four five-inch guns, and two three-inch guns. Mine fields surrounded the Pea Patch, and the Delaware was finally considered impregnable.[24]

Although the three forts were not completed by 1898, at the outbreak of the Spanish-American War, they were heavily manned, as anxiety swept the Atlantic coast, in anticipation of a breakout and raid by Spanish Admiral Pascual Cervera and his squadron of four armored cruisers and three destroyers, currently bottled up in Santiago Harbor. The threat was never realized. Cervera's fleet was destroyed, and the coastal forts settled down to somnolence once more.



World War I Engineer Recruiting Poster. One of a vast number of Engineer Recruiting Posters of the period. The treatment appears to be at least partially jocular if one recalls the central figure's resemblence to Charlie Chaplin in the World War I hit, "Shoulder Arms."

—National Archives

WORLD WAR I

Not until World War I was the Corps of Engineers again called upon to engage in military construction. During that war the Corps mushroomed from 256 officers and 2,200 enlisted men to an incredible 11,175 officers and 285,000 enlisted men, or twelve percent of the Army's total strength. Much has been written of the Corps' activities in France—the bridges and roads they built, the battles they fought in. By Armistice Day 1918, over 117,000 men were engaged in military construction alone. These men built 18 new ship berths; 225 miles of barracks; 127 miles of hospital wards; 80 miles of warehouses; they cut 190 million board feet or lumber—3-1/2 million cross ties, 302,000 cords of fuel wood, and 38,000 piles.

In France, all the conflict was not with the enemy. An inter-departmental battle was being waged between the Engineers, the Quartermaster Corps and the Transportation Department, each wanting exclusive rights to the military construction mission; as a result, the command continually shifted back and forth among the three of them.[25]

Back in the States, all military construction was under the aegis of the Cantonment Division of the Quartermaster Corps. Across the country the cry had gone out for new warehouses, depots, and troop cantonments. Thirty-two cantonments (big enough to house over a million men) were to be built in the four months between May and September 1917, at a cost of $90 million. On 14 June 1917 in the Philadelphia District area, work began on Camp Dix, at Wrightstown, New Jersey, fifteen miles south of Trenton. By 16 July construction was in full swing. When completed at a cost of $9,623,067, the 6,500 acre facility was responsible for training eight infantry divisions, a full 60,000 men, with the post population reaching a 1918 peak of 70,000 soldiers.[26]

Another major area project was the construction of a great military port terminal at Philadelphia, to serve as part of a vast system of interior depots and port terminals designed to move men and material quickly and efficiently to France. One such terminal—

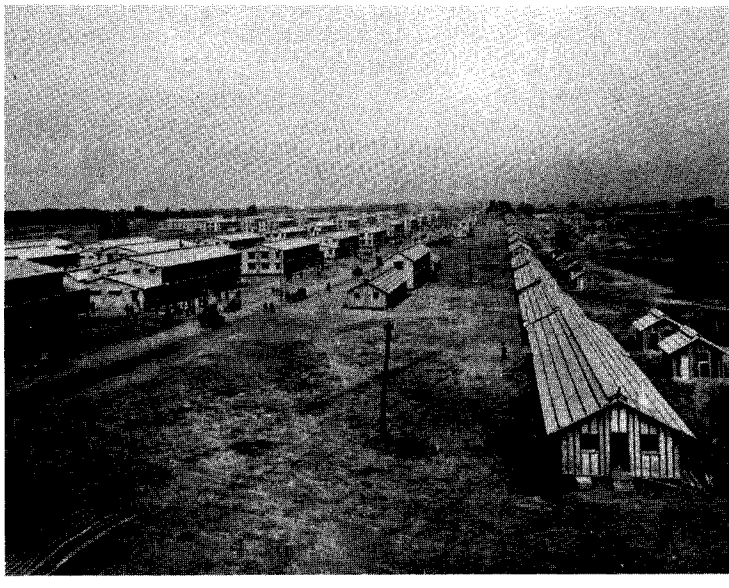
> *occupies a tract of land 3,800 feet in length along a ship-canal that has a depth of twenty-five feet and a length of 1,600 feet. Special tracks have been constructed measuring 1,100 by 160 feet; nine large storehouses; open shed 1,200 by 500 feet, together with quarters for the stevedore troops. A series of warehouses have also been built 160 feet in width, in multiples of 140 feet in length. Another of the*

Philadelphia Quartermaster Terminal, through which untold thousands of tons of war supplies moved on their way to the battlefields of France.

—Library of Congress

great port terminals has a pier extending 1,500 feet, and utilizes 400,000 square feet of shed-storage.[27]

In the twenties and thirties there was little military construction in the District, and none outside of fortifications. The Construction Division of the World War I Army had been absorbed by the Quartermaster Corps on 15 July 1920 and had become the Construction Service of the Quartermaster Corps. This independent arm of the Quartermaster Corps held uninterrupted sway over the diminished field of military construction for the next twenty years, while engaging in a continuous battle with the Corps of Engineers to keep that sway. When war finally came, suddenly on 7 December 1941, major military construction projects were just being transferred to the Corps of Engineers—including, in the Philadelphia District, Fort Dix, Fort Monmouth, and the giant Quartermaster Supply Depot in Philadelphia.



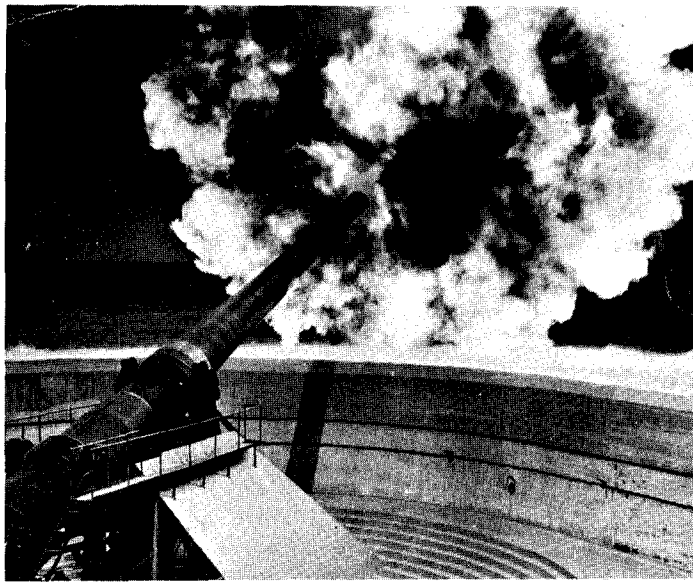
Camp Dix, Wrightstown, New Jersey, January 1919. General View of the Camp.

—National Archives

WORLD WAR II

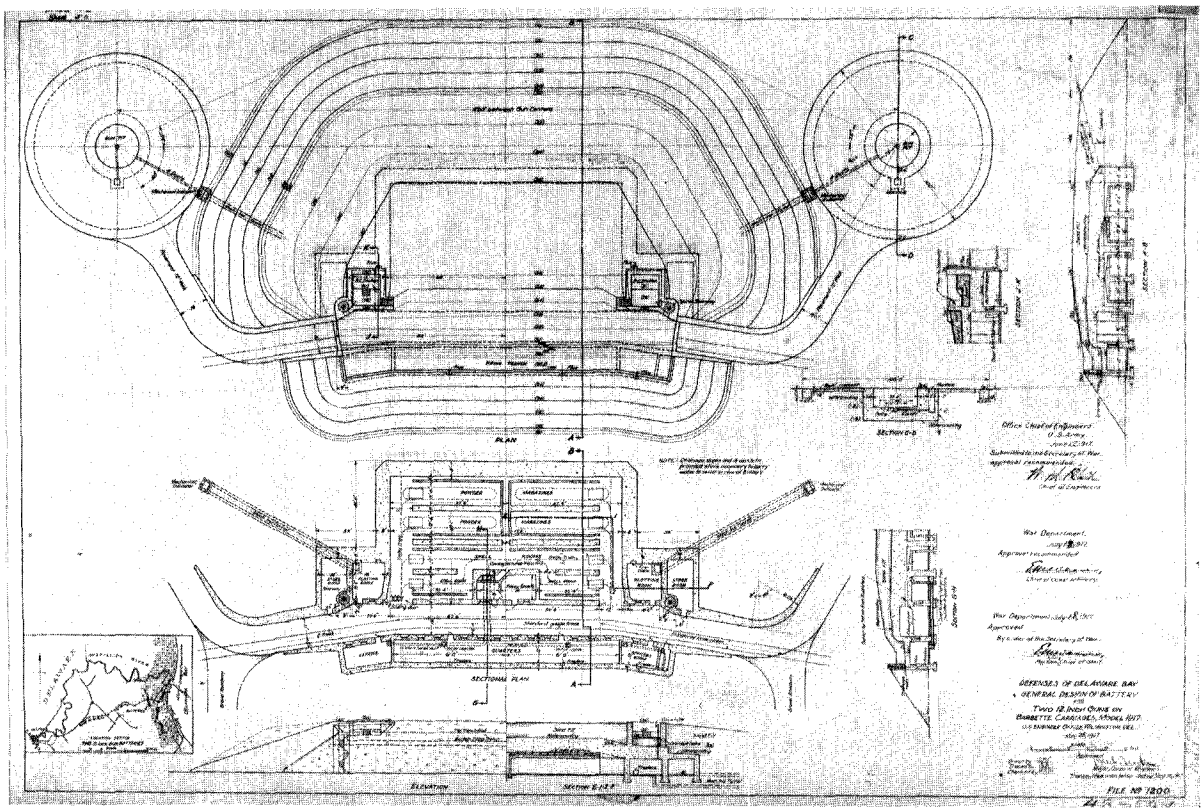
War clouds were looming in Europe. In September 1939, Hitler's panzers plowed through Poland, and in a matter of days, the continent was ablaze. As the "arsenal of democracy" and Britian's chief military supplier, the United States felt herself being drawn closer to the war.

Before the war, the only military construction the Philadelphia District Office of the Corps engaged in was for coastal and harbor defense. Four twelve-inch guns were installed at Fort Saulsbury, near Milford, Delaware, shortly after World War I. In 1940, the Corps began the installation of massive eleven-foot thick concrete emplacements for sixteen-inch guns at Fort Miles near Lewes, Delaware. These guns, with a range of twenty-six miles would, in combination with a twelve-inch battery transferred from Fort Saulsbury, two six-inch support batteries, and an additional six-inch battery mounted on the opposite



The Model 1895 12-inch rifle was 37 feet long, and could fire a 900 pound steel shell approximately 29,000 yards.

—U.S. Army Photograph



Plan for one of the casemates at Fort Saulsbury detailing the placement of two of four Model 1895 M-1 12-inch rifles mounted on Model 1917 barbette carriages, which comprised the main armament of the Fort.

—National Archives